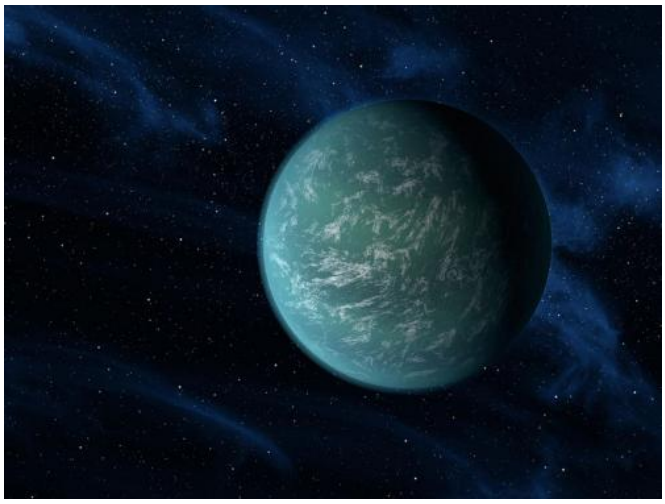
Space scientist sums up where we're at in the search for life on other planets

5 August 2014, by Bob Yirka



This artist's conception illustrates Kepler-22b, a planet known to comfortably circle in the habitable zone of a sun-like star. Credit: NASA/Ames/JPL-Caltech

(Phys.org) —Sara Seager, astronomer, planetary scientist and professor at MIT, has published an analysis of the current situation regarding the search for life outside of our own planet in the journal *Proceedings of the National Academy of Sciences.* She describes the current methods being used to look for extraterrestrial life, and what lies ahead as new technology is applied to the task.

To date, no known credible evidence exists that even suggests that life exists anywhere else but on planet Earth. But as Seager points out, there are over a hundred billion stars in our galaxy alone, and theorists predict that as many as a hundred billion universes exist—thus the odds seem to overwhelmingly support the notion of life existing somewhere out there. The trick is in finding proof of it.

Currently, Seager notes, the most popular way of studying possibly habitable planets for life involves studying their atmospheres. If space scientists can find evidence of chemicals in an exoplanet's atmosphere that have a low probability of being there in the absence of life, then they'd have a case for a looking a lot closer—for such experiments, spectroscopy is used to look for possible changes to the spectrum of light observed.

Looking at a distant planet's atmosphere isn't easy, of course, scientists have two options—both involve studying planets as they pass in front of their star (transits). The first involves using telescopes that use mirrors to blot out the light from the star, leaving just data from the planet. The second approach involves deploying a starshade, a space vehicle positioned between a telescope and the object under study. The starshade blots out the light from the star, allowing for better examination of the planet and its atmosphere.

Fortunately for space science, new technology is on the way, the James Webb Space Telescope is set for launch in 2018—it's expected to offer unprecedented views of so-called super Earth's (those similar to Earth, but somewhat larger) though it will still rely on transits. What's really needed is new technology to allow for studying planets without having to wait for their transit. The holdup is in figuring out how to capture imagery from such a relatively small object, one that is merely reflecting the light from its own star and is thus much dimmer. Seager suggests the solution is building much bigger telescopes with huge apertures. We'll have to wait as see, as only time will tell if we humans deem it important enough to invest the massive amount of money that would be needed for such a telescope.

More information: The future of spectroscopic life detection on exoplanets, *PNAS*, Sara Seager, DOI: 10.1073/pnas.1304213111

Abstract

The discovery and characterization of exoplanets have the potential to offer the world one of the most impactful findings ever in the history of astronomy—the identification of life beyond Earth. Life can be inferred by the presence of atmospheric biosignature gases—gases produced by life that can accumulate to detectable levels in an exoplanet atmosphere. Detection will be made by remote sensing by sophisticated space telescopes. The conviction that biosignature gases will actually be detected in the future is moderated by lessons learned from the dozens of exoplanet atmospheres studied in last decade, namely the difficulty in robustly identifying molecules, the possible interference of clouds, and the permanent limitations from a spectrum of spatially unresolved and globally mixed gases without direct surface observations. The vision for the path to assess the presence of life beyond Earth is being established.

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